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Abstract

The trading of private securities has recently gained greater visibility and importance with the advent of organized, private security exchanges. This paper uses data on IPO firms that list on the SharesPost private securities exchange platform to examine the potential benefits of a listing. Specifically, we test whether a listing reduces IPO underpricing or enables liquidity provision to firm employees. Controlling for endogeneity, we find no evidence that a pre-IPO listing on SharesPost lessens IPO underpricing. However, we also find that SharesPost-listed companies are able to pay their employees less in cash and more in stock and stock options than comparable non-SharesPost companies. Further, executive officers in SharesPost-listed IPO companies sell less shares during the IPO. These findings suggest that liquidity provision via the SharesPost platform significantly influences the form of compensation paid to employees before IPO and reduces the amount of capital raised in a funding event that must be allocated to meet employee needs.

Keywords: Private markets, market efficiency, information asymmetry, IPO

JEL Classification: G12, G14, G24

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1. Introduction

The average length of time for a venture capital-backed start-up to go from founding to initial public offering (IPO) is now roughly 10 years, more than double the four year average a decade ago.[1] Difficult economic conditions following the financial crisis and fallout from the bursting of the dotcom bubble in 2000 combined to produce a dramatic decrease in IPOs in markets around the world.[2] In turn, the collapse of IPO markets made it difficult for risk and venture capital (VC) providers to exit their investments. For the larger, more established private companies still in demand in the IPO market, new problems emerged after the 2008 crises: the regulation of financial institutions intensified. To comply with these enhanced regulations, financial institutions introduced various risk-mitigation measures that made IPOs more complex and expensive.

Challenged by these new circumstances, the private equity industry devised alternative methods to finance private firms. Many new platforms, such as crowdfunding and peer-to-peer business lending, entered the arena in conjunction with several new entrepreneurial financing instruments, such as equity-like mezzanine, reward, and donation-based financing. The platform that we focus on in this paper, the SharesPost secondary market, belongs to this group of new initiatives within the private equity market that blur the stark distinction between public and private equity markets. Specifically, we examine whether the SharesPost secondary market aids private firms in the pricing-setting process as they transition from private to public markets during IPO and whether the SharesPost market provides liquidity to management and directors of these private firms during the now-prolonged period before they go public.

The primary function of the private secondary market is to mitigate the negative effects private firms experience when they do not have access to the public capital markets. The SharesPost platform, as a financial intermediary in the private market, may partially fill the pre-IPO investment banking role of gathering information and assessing market demand in order to set an appropriate IPO offer price. Given the sizable volume of some recent private issues, we expect that market transaction data such as trading volume, indications of interest and realized sales price will reduce information asymmetries.

Despite evidence that underwriters utilize transaction data from the private markets to aid in the setting of IPO offering prices,[3] several other characteristics of the private markets raise questions about the informativeness of private market transaction prices. First, because many of the shares sold in private markets such as SharesPost and SecondMarket are restricted private securities, issuers are not required to disclose financial information about the firm. Thus, it is not evident, ex-ante, what information is incorporated in prices. Second, because of sales restrictions, many private market shares have limited liquidity, further inhibiting the informativeness of the contracted sales price. Cole, et al. (2016, page 1), however, find that pre-IPO trading in the OTC market lowers IPO underpricing, despite "important limitations, such as low liquidity, high volatility, lack of analyst following, and high fraud levels, that allow uncertainty to remain high." Since the nature of private market platforms like OTC and SharesPost varies, the question of whether information asymmetry is reduced by trading in the private secondary markets during the pre-IPO period remains. We address this question in this study.

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[1] See, e.g., Mendoza and Vermeulen, 2011; Tortoise & Hare Revisited: "Time To IPO" For VC-Backed Startups, Forbes, February 24, 2015; But When Will They Go Public? A Profile of the Average Company at IPO, Equityzen.com, August 13, 2015.

[2] Consider, for example, Germany, where the Neuer Markt (the stock market segment for high tech and innovative ventures) closed down in 2001 (Vismara et al. 2012).

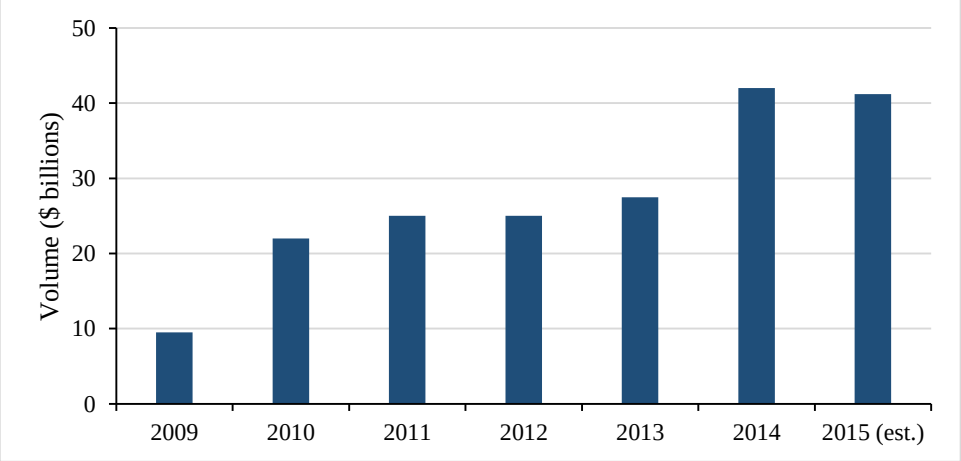
[3] Zynga, Inc. notes in its 2011 S-1 registration statement that transactions in the private secondary market are the "primary basis for determining the fair value of our common and… preferred stock" (page 66). Jive Software incorporated volume and pricing data from "(an) increased number of (private) secondary transactions in our common stock" during the pricing of its IPO (2011 S-1 registration statement, page 62).

The lengthening of the start-up lifecycle has consequences for start-up firms, their employees and the institutions that fund them. Firm employees are now forced to hold illiquid stock options and stock grants for a much longer period until the firm IPO that allows them to cash-in. For firm management, providing near-term liquidity for employee stock compensation is a feature that enables them to attract, retain and ensure the commitment of the top-flight talent that fuels revolutionary new ideas and growth. Extending the time to IPO thus affects employee compensation and retention. Buy-side investors have a similar problem. Those who missed early investment opportunities in promising new firms would prefer to invest pre-IPO rather than wait until shares hit the public market because skyrocketing valuations for late-stage start-ups limit future returns.

These needs, among others, have helped fuel the recent popularity of the private secondary market. New intermediaries such as Nasdaq Private Market, SharesPost and SecondMarket have, by leveraging electronic market platforms that allow for standardization, efficiency and lower transaction costs, largely replaced the old ad-hoc services traditionally offered by brokerage firms. As a result, the volume of annual secondary market transaction has increased from roughly $10 billion in 2009 to over $40 billion in 2014 (J.P. Morgan, 2015). Figure 1 presents annual secondary deal volume from 2009 to 2015.

Figure 1: Annual secondary transaction volume

This figure presents annual secondary private equity transaction volume, in US $, billions. Data is compiled from reporting by Cogent, UBS and J.P. Morgan Asset Management. 2015 annual data is estimated by annualizing 2015 first half volume as reported by intermediary firm Setter Capital and Dow Jones & Co., Inc.



Despite the rapidly growing size of the U.S. private secondary market, there is very little in the way of rigorous academic study of the U.S. market and its effects. Our empirical study aims to contribute to the literature in three ways. First, we provide a depiction of this rapidly evolving industry. Second, using data from the SharesPost private secondary market platform, we test whether a firm's listing on SharesPost prior to an IPO reduces information asymmetry and resulting underpricing during the IPO. Third, we use data gathered from SEC documents for IPO firms listed on SharesPost to test whether a pre-IPO SharesPost listing provides liquidity to firm employees.

This study contributes to several strands of literature, including the extensive literature on IPOs and information asymmetry. We examine the effects of pre-IPO trading in the private securities market on IPO underpricing and initially find that IPO underpricing, and post-IPO return volatility, of SharesPost-listed firms is greater than that of non-SharesPost-listed firms. However, after controlling for firm and IPO characteristics we find that a SharesPost listing has a statistically insignificant effect on

IPO underpricing. This finding is robust to i) controlling for the endogeneity of the SharesPost listing choice and ii) the reduction of bias from confounding factors using a matching technique. This finding is inconsistent with the evidence that pre-IPO trading in the OTC market reduces IPO underpricing (Cole, et al., 2016) and that pre-IPO prices in the AIM and Taiwanese markets are informative about post-IPO prices (Derrien and Kecskés, 2007; Chang, et al., 2017). Because SharesPost-listed IPO firms are predominately highly-visible technology firms who receive much press and investor attention, the additional information provided by private trading on SharesPost appears to provide little in the way of additional information to attenuate uncertainty during the IPO process.

We also highlight another important aspect of SharesPost secondary markets, which is to provide liquidity to several sets of stakeholders. We find that SharesPost-listed private firms are able to pay their employees less in cash, and more in stock and stock options, than non-SharesPost companies. SharesPost-listed firms pay 54% of total executive compensation in stock in the year before IPO, on average. This percentage is significantly higher than the 35% average for a matched sample of comparable firms that do not list on SharesPost. This finding is robust to compensation, industry, firm and financing characteristics. Furthermore, we find that a listing on SharesPost has a negative and significant effect on the percent of founder, executive officer and director shares offered in an IPO. This result is robust to industry, firm and financing characteristics and suggests that the enhanced liquidity from the SharesPost platform reduces the proportion of raised capital that must be allocated to meet employee sales, which allows more of the total proceeds to go toward funding company growth. Given the recent emergence of private markets and the availability of historical data, we highlight this as a promising area for future research.

The remainder of this paper is organized as follows: Section 2 discusses the relevant literature that informs the hypothesis development. Section 3 outlines recent developments in the secondary private securities and depicts the current state of the market. Section 4 describes the data. Section 5 presents and interprets test results on the effects of a SharesPost listing on IPO underpricing, while Section 6 does the same for employee compensation. Section 7 provides concluding remarks.

2. Literature review and hypothesis development

2.1 Information asymmetry and IPO underpricing

Financial intermediaries help overcome the informational frictions in a market-based economy. Leland and Pyle (1977) suggest that information asymmetry is the essential reason for the existence of financial intermediaries and that information sharing needs lead financial intermediation. Firms employ financial intermediaries during security offerings to reduce informational frictions with investors by enabling a credible third party (the intermediary) to produce information (see, e.g., Titman and Trueman, 1986; Carter and Manaster, 1990; Ljungqvist, 2007). Taken together, the evidence in these studies highlight the importance of using a third party as a tool to mitigate informational problems.

One of the biggest challenges for a buyer investing in a private company is the lack of credible information. Private companies are highly opaque with a correspondingly high cost of gathering information (Lerner and Schoar, 2004; Sahlman, 1990). Under these circumstances, financial intermediaries (such as private equity firms) typically step in to fill the need for capital by investing in these companies through buyouts, growth capital or venture capital. Private equity firms provide capital, as well as business and managerial expertise, to these early-stage companies (Lerner, 1995) and, at the same time, facilitate the provision of credible information to investors, thus reducing information asymmetry between companies and investors (Amit, et al., 1998). It is through this monitoring and certification role that intermediaries increase the likelihood that investors may successfully exit a private company investment through initial public offering (IPO) or acquisition (Megginson and Weiss, 1991; Barry, et al., 1990).

Further complicating the process is the fact that private firms are often reluctant to reveal a great deal of information, especially if the business is heavily invested in a technological advancement that has proprietary value. For this reason, some private equity firms are reluctant to enter the public equity markets, given the high disclosure requirements (Spiegel and Tookes, 2008). According to Spiegel and Tookes (2008), larger, more profitable firms with small rivals, in particular, have the greatest incentives to innovate and, thus, shy away from the public markets in order to keep information private. Following enactment of the Dodd-Frank act, the IPO process now requires even greater revelation of even more information. These requirements likely contribute to decisions by successful private firms such as Uber and Airbnb to stay private for a longer time period despite apparently high demand in the IPO market. Under these circumstances, financial innovations such as SharesPost are bridging the gap to support private firms during this time of transition in the IPO market.

We hypothesize that the SharesPost platform may act as a financial intermediary prior to IPO date, partially filling the role of an investment bank who assesses market demand in order to set an appropriate price per share for the IPO, without incurring the actual costs of a going public transaction. A platform such as SharesPost gives smaller investors the opportunity to invest in private equity by purchasing shares of private companies. For these smaller investors, this means greater liquidity, accessibility and the opportunity to buy private companies without a large capital commitment (Brown and Kraeussl, 2012). For shareholders in the listed firm, such as employees and private equity investors, this means greater available liquidity by selling shares on SharesPost. In this way, a listing on SharesPost may boost the company's long term prospects, as the existence of such a preliminary platform for exchange may reduce information asymmetry and thus make the IPO transaction smoother, on the margin, as compared to a similar private company not listed on SharesPost.

However, relatively little research focuses on the effects of trading in the U.S. private securities markets. Cole, et al. (2016) examine IPO underpricing for firms that list first on the OTC market before listing on a national exchange where IPO's are normally executed[4]. They find that these firms experience a reduction in uncertainty during pre-IPO trading, lower IPO underpricing and lower post-IPO return volatility. Chang, et al. (2017) study Taiwan's mandatory pre-IPO market and find that, despite the informativeness of pre-IPO prices on the exchange, IPO underpricing remains high – first day returns average 55%. They conclude that agency problems, not asymmetric information, are the cause of such levels of underpricing. They also note that government restrictions on IPO pricing have since reduced the average first day return to 27%. Studies of pre-IPO European trading markets such as AIM in the U.K. (Derrien and Kecskés, 2007), and grey market trading in Europe (Cornelli, et al., 2006; Aussenegg, et al., 2006) indicate that pre-IPO prices may be informative about post-IPO prices, but the evidence on underpricing is unclear.

Further, Vismara, et al. (2012) show that most secondary markets in Europe fail. They find that the long-run performance of second-market IPOs in Europe is poor relative to main market IPOs and that IPOs that list on second markets are more likely to be subsequently delisted or targeted by an acquiring firm. However, London's AIM market, which has less stringent listing requirements than other secondary markets, is an exception. The authors argue that the success of the AIM market might be attributable to its low cost of entry and less stringent information requirements. In a similar study, Meoli et al., (2016) examine the effectiveness of the junior public equity markets in readying growth-oriented firms for the senior equity markets. Specifically, they examine the performance of firms that graduate from the Toronto Venture Stock Exchange (TSX-V) to the senior Toronto Stock Exchange (TSX), and compare the post-graduation performance against the performance of VC-backed firms that directly have

[4] Although a formal definition of "OTC market" is not provided in the study, the exchanges SharesPost and SecondMarket are not referenced in the paper and the context of the analysis leads to the reasonable assumption that the OTC markets analyzed are the public OTC markets OTCQX, OTCQB and OTC Pink marketplaces (previously the OTC Bulletin Board and Pink Sheets).

an IPO on the TSX. They find that TSX-V graduations on average significantly outperform VC-backed IPOs by 28.2 percentage points in the three years following the TSX listing.

An important distinction between the North American and European markets is that the TSX-V is a sequential segmentation market. While the TSX-V has modified listing and governance requirements as compared to the TSX, TSX-V IPOs are approved by the same securities regulators as senior market IPOs and are brought to market by the same underwriters. Meoli et al., (2016) assert that the sequential segmentation model may provide an opportunity for junior public firms to seamlessly transition to a senior stock market. We argue that SharesPost may have a similar effect, thus making the transition to public markets more seamless.

Collectively, the IPO literature shows that IPOs are underpriced, on average; the typical issue experiences a significant increase from the offer price to the closing price on the first day of trading (see, e.g., Stoll and Curley, 1970; Ibbotson 1975; and Ritter and Welch, 2002).[5] This phenomena is subject to considerable temporal variation, however. Underpricing averaged 18.8% from 1980 to 2001, with a high of 65% during the dot.com boom years 1999 to 2000, but only 7.4% during the 1980's (Ritter and Welch, 2002). The IPO literature also establishes that the cross-sectional variation in first day IPO returns is higher in the presence of greater information asymmetry (see, e.g., Ritter, 1984 and Lowry, et al., 2010).

We use IPO underpricing as a proxy for information asymmetry during the IPO pricing process. If IPO underpricing is caused by information asymmetry, then activity that provides information about a firm's future prospects, investor demand for firm stock, or market price of the stock should reduce the level of IPO underpricing. We test the hypothesis that pre-IPO trading on the SharesPost platform reduces information asymmetry for SharesPost-listed firms which, in turn, reduces IPO underpricing.

A testable prediction of the *asymmetrical information reduction* hypothesis, as synthesized from the discussion above, is as follows:

> *H1: IPO firms who experience pre-IPO trading from a listing on SharesPost experience lower information asymmetry and thus, lower IPO underpricing*

2.2 Employee compensation and liquidity risk

A challenge facing investors in the market for private companies is the need for substantial, long-term capital commitments. Investments in private companies are typically highly illiquid with an average duration of 8 to 10 years. As a result, institutional investors are generally the investor type best able to consistently commit capital to such long term, illiquid assets. Institutional investors typically invest in private start-ups through the use of limited partnership funds managed by a VC general partner. VC funds generate return through capital gains in exit transactions; IPO exits are the preferred exit route as they typically provide VCs with the greatest returns and reputational benefits (see, e.g., Gompers, 1996 and Gompers and Lerner, 1999, 2001). One of the biggest risks a VC takes on during the start-up lifecycle is liquidity risk. Cumming, et al. (2005) define liquidity risk in this context as the risk of not being able to effectively exit and thus being forced either to remain much longer in the venture or to sell the shares at a high discount.

In a similar manner, managers of start-up firms are subject to a type of liquidity risk. Meulbroek (2001) notes that managers of young, private growth companies typically have a large fraction of personal wealth tied up in firm stock. Furthermore, these managers hold firm stock in portfolios that are undiversified. Managers thus have an incentive to diversify their portfolio by selling firm stock but are constrained by the availability of liquidity events in much the same way VC firms are. If the lengthening of the start-up cycle increases liquidity risk then mechanisms that provide liquidity in the private market pre-IPO, such as private secondary marketplaces like SharesPost, should decrease liquidity risk by

[5] The literature uses first day returns as a measure of IPO underpricing.

blurring the distinction between public and private equity markets. Ibrahim (2012) models the benefits of increased liquidity in the private secondary market.

According to agency theory, there is a tradeoff between incentive compensation and risk. Since agents need to be compensated for greater risk through higher wages, the firms need to trade off incentive-based compensation against higher wage costs. Aggarwal and Samwick (1999) and Jin (2002) find empirical results supporting this argument. They find that pay-performance sensitivity is decreasing with risk. There are several possible reasons why the agent may discount stock compensation overall under a high risk setting, especially in more established private companies that are traded on SharesPost. First, agents in private companies are typically undiversified with a significant portion of their wealth tied up in company stock. This causes the executive to discount the value of the stock based compensation even more (Core et al., 1999; Meulbroek, 2001; Jin, 2002).

Second, the executives will want to diversify their portfolio by selling shares or exercising stock options. This will decrease the incentive alignment goal and also send a negative signal to the markets regarding the value of the firm (Meulbroek, 2001). Considering these factors, and consistent with the trade-off of risk and incentives in the traditional agency model, we argue that for the private companies in our SharesPost sample, incentive-based compensation should increase with decreases in liquidity risk. For that reason, we argue that companies that are listed on SharesPost will be able to offer its employees more stock based compensation and that the employees will hold onto their shares more during the IPO given the reduction in liquidity risk and their resulting ability to more easily sell shares pre-IPO.

We use data on executive compensation from SharesPost-listed companies to test the hypothesis that a listing on the SharesPost platform reduces liquidity risk. We hypothesize that companies that list on SharesPost will be able to offer their employees more stock-based compensation and that the employees will sell less shares during the IPO due to the pre-IPO liquidity provided by SharesPost.

A testable prediction of the *increased liquidity* hypothesis, as synthesized from the discussion above, is as follows:

> *H2: IPO firms who experience pre-IPO trading from a listing on SharesPost experience greater liquidity and thus, pay their employees more in stock and stock options.*
>
> *H3: IPO firms who experience pre-IPO trading from a listing on SharesPost experience greater liquidity and thus, rely less on IPOs to provide liquidity to their employees.*

3. Evolution of the private securities market

Today's private secondary marketplace looks little like the obscure institutional market of two decades ago. That market was characterized by very low volume, high transaction costs and almost exclusively institutional participants dealing in distressed assets (Mendoza and Vermeulen, 2011). Today's market consists of multiple electronic platforms, comparatively high volume, (relatively more) standardized execution, lower transaction costs and a participant base made up, increasingly, of individual investors.

The secondary market for private securities is, in effect, two distinct markets. The "fund market" is the market for limited partnership (LP) interests in VC funds. The "direct market" is the market for the stock of (private) start-ups. Although related, the two markets did not develop synchronously. This section reviews the evolution of the marketplace and describes the state of the market as of the drafting of this manuscript.

3.1 The fund market

The fund market originated over 25 years ago when the first private equity funds were raised to purchase limited partnership interests in VC funds (Ibrahim, 2012). The first dedicated electronic platform for the fund market was introduced shortly thereafter when Nasdaq launched the PORTAL system in 1990 to

facilitate trade in restricted private securities by qualified institutional buyers, as permitted under Rule 144a that regulates private placements. The market continued to grow during the 1990's dot.com era as more players entered the picture. NYPPEX, formed in 1998, was one of the first private market intermediaries dedicated to providing liquidity to the private secondary market; it now hosts over $10 billion in secondary private equity interests (Birdthistle and Henderson, 2009).

Today, the fund market consists of a multitude of investment funds dedicated to purchasing LP interests in venture capital, private equity, hedge funds and other illiquid interests. Investors sell primarily for idiosyncratic liquidity reasons or to rebalance their portfolios while purchasers are typically motivated by the steep discounts available on the LP's portfolio of uncertain private investments.

3.2 The direct market

The direct market for private firm shares arose as a means of providing liquidity after the dot.com bust left many saddled with e-commerce stocks no longer tradable on public exchanges (Burstein and Schwerin, 2008). In its infancy, the market consisted of one-off transactions; shareholders either sought out funds dedicated to purchasing private secondary interests or those funds attempted to identify firm employees or shareholders willing to sell. Search, information and transaction costs were understandably high.

As the volume and value of such deals increased, a new type of player entered the direct market. In 2009, SecondMarket and SharesPost began operation as intermediaries offering to facilitate transactions through their respective electronic marketplaces. Both firms offered features akin to a true marketplace. They i) attracted both buyers and sellers to a central location, ii) facilitated price discovery through quoted bid and offer information, and iii) reduced transaction costs by offering standardized sales contracts as well as streamlined escrow services (Ibrahim, 2012). Volume in high-profile firms such as Facebook, LinkedIn and Twitter spiked.[6] SharesPost reported an estimated $2 billion in direct share trades from 2009 to 2014; SecondMarket reported $1.5 billion in 2013 alone.[7] [8] Nasdaq entered the market with the launch of Nasdaq Private Market in 2014 as a joint venture with SharesPost.

The growth of the direct market was driven primarily by two factors. First, as discussed, the lengthening of the start-up lifecycle had forced investors in private firms to seek liquidity in the private secondary market rather than wait for the traditional IPO exit. The "private IPO", or late-stage growth funding, has effectively replaced the IPO as the preferred vehicle for financing large, mature private startups. PitchBook estimates that the total value of "private IPO" rounds of $40 million and above were almost three times that of IPOs in 2014, and more than five times that of IPOs in the first half of 2015.[9] Second, the Jumpstart Our Business Startups (JOBS) Act that took effect in 2013 raised the maximum number of shareholders in a private company (excluding employees) from 500 to 2,000. This allowed outside investors greater access to private companies and fed the increase in trade volume on private secondary exchanges.

However, secondary sales create problems for the start-ups themselves because share sales to anonymous investors complicate a firm's ownership structure.[10] Pre-IPO share sales increase administrative costs, expose the firm to potential legal issues and create demand from new investors for information that private companies may not be willing to share. In response, private companies took

[6] Private Share Trading Takes off as Tech Companies Shun IPOs, Financial Times, June 2, 2015.
[7] SecondMarket Sets up Transfer Facilities for Startups to Manage Secondary Sales, TechCrunch.com, April 14, 2015.
[8] Private Share Trading Takes off as Tech Companies Shun IPOs, Financial Times, June 2, 2015.
[9] The Emergence of the "Private IPO", PitchBook.com, August 5, 2015.
[10] Once a sale is effected, outside investors become part of the capitalization table which records the ownership percentages of founders and investors through various rounds of financing. Thus, higher shareholder turnover becomes an increasingly burdensome and costly legal process for these private companies to manage.

steps to control the sale of their shares. Many increasingly exercised their right of first refusal[11] and utilized very strict no-transfer clauses.[12]

Today, the direct market operates in a more orderly, structured fashion and oftentimes at the direction of the listed companies themselves. Formal company-sponsored tender offers now make up the bulk of secondary direct sales. These programs allow companies to control the type of buyers who acquire ownership interest; potential investors are typically mutual funds, VC funds and private equity funds who missed out during primary rounds. Employees sell to these small pools of pre-selected investors at preset prices, allowing them to cash in on previously illiquid incentive compensation. As a consequence, SecondMarket ceased direct share trading and focused exclusively on tender offers. SharesPost also shifted focus to tender offers but continued with direct share trading through the joint venture Nasdaq Private Market. Nasdaq purchased SharesPost's interest in Nasdaq Private Market in late 2015 and concurrently acquired SecondMarket, leaving SharesPost and Nasdaq Private Market as the two leading private secondary marketplaces.

4. Data sample and variable construction

4.1 Sample and data construction

The sample period used for this study includes the years 2009 to 2015. We collect data on all firms that list on the SharesPost exchange prior to going public during the period 2009 to 2015; the initial sample totals 62 firms. Identification of SharesPost-listed firms that subsequently listed via IPO was gathered through contact with representatives of the SharesPost exchange and through manual collection of data from the SharesPost website.[13]

We use Thomson Financial's SDC Platinum IPO data to compile the initial sample of 1,548 non-SharesPost IPO firms for the years 2009 to 2015. We restrict both SharesPost and non-SharesPost firms to those firms contained in the CRSP monthly stock file; the CRSP file is comprised of publicly traded firms on the NYSE, Amex and NASDAQ stock exchanges. We follow the IPO literature in applying the following data filters: we exclude all IPOs with an offer price less than $5; we retain only ordinary common shares of U.S. companies (CRSP share codes 10 and 11); we exclude IPOs in the financial services industry (SIC codes 6000 to 6999) and we exclude real estate investment trusts (REITs), closed-end funds and American Depositary Receipts (ADRs).

Variables based on balance sheet data are computed using data from the Compustat Fundamentals Quarterly file for the quarter immediately prior to the IPO date. Data for firm age is compiled from Jay Ritter's data on firm founding dates[14] and augmented, where necessary, using data from firm SEC filings. Average underwriter ranking and average monthly IPO returns is compiled from Jay Ritter's IPO data.[15] Data for IPO characteristics, securities exchange and VC funding is compiled from the Thomson Financial SDC Platinum IPO database. Applying these data restrictions reduces the initial sample of SharesPost firms from 62 to 55 firms and the initial sample of non-SharesPost firms to 503 firms. Data on firm sales and distance to SharesPost headquarters limits the non-SharesPost firm sample to 446 firms.

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[11] In general, a shareholder in a private firm must obtain management approval before he can sell shares in that firm; this right of first refusal (ROFR) allows companies to retain control over share sales. Firm by-laws that govern a firm's securities activity may include prohibitions on stock option transfers, prohibitions on transfer of unvested stock shares, the right of first refusal on vested shares, required approval by the board of directors of all share sales, or the enforcement of new share restrictions on any share purchases (Belt et al., 2014).

[12] Private Share Trading Takes off as Tech Companies Shun IPOs, Financial Times, June 2, 2015.

[13] https://sharespost.com

[14] http://bear.warrington.ufl.edu/ritter/FoundingDates.htm

[15] https://site.warrington.ufl.edu/ritter/ipo-data/

4.2 Variable construction

Definitions for all variable are presented in Table 1. Our measures of IPO underpricing, compensation and compensation liquidity are:

- *First day return***:** logarithm of the percent change from the offer price to the closing price on the first day of trading (i.e., day of offer).
- *21 day return***:** logarithm of the percent change from the offer price to the closing price on the twenty-first day of trading. Lowry, et al. (2010) use this as an alternate measure of underpricing in order to avoid distortions from underwriter price support.
- *Stock Compensation (%):* ratio of stock-based compensation (stock grants and stock options) to total compensation.
- *Shares offered in IPO (%)* Number of shares offered / total shares owned prior to offering.

Some of our primary measures of IPO, compensation, financing and firm characteristics are as follows:

- *IPO, # of shares (log)***:** Lowry, et al. (2010) argue that smaller issues have greater asymmetric information and, thus, greater underpricing, on average.
- *Underwriter rank (average)*: Highly ranked underwriters may be able to price the issue more accurately, thus reducing underpricing. Alternatively, highly ranked underwriters may lead to greater underpricing as issuers pay for coverage by the more prestigious analysts employed by the highly ranked underwriters by accepting greater underpricing (Loughran and Ritter, 2004).
- *Offer price revision***:** Butler, et al. (2014), in a comprehensive examination of the IPO literature, find that offer price revision is a significant predictor of initial IPO returns.
- *Firm age as of IPO date (log)***:** an alternate measure of risk because the future returns of younger firms tend to be less certain than those of large firms, all else equal.
- *Firm cash flow***:** an alternate measure of risk because firms that experience decreases in cash flow, and lower levels of cash flow, tend to have more uncertain future prospects. The level of firm cash flow will likely also influence the medium of employee compensation for the small, private companies in the sample; decreases in firm cash flow should increase the level of stock compensation.
- *Firm debt:* a measure of financial leverage that proxies for firm risk.
- *Intangible assets:* an alternative measure of firm risk.

Table 2 reports descriptive statistics for the explanatory variables used in regression analysis.

5. The influence of SharesPost listing on IPO returns

5.1 IPO returns and characteristics

If, as hypothesized, pre-IPO trading of SharesPost-listed firms lessens firm information asymmetry then we should expect initial returns of IPOs for these firms to be lower, on average, than for firms who do not list on SharesPost. Table 3 reports the results of univariate tests of IPO returns and variables used to explain IPO returns.

SharesPost-listed firms have a median first day (21 day) return of about 33% (25%) while all other IPO firms have a median return of about 8.75% (14.4%). The difference in mean returns are significant at the .01% (5%) level. SharesPost firms offer more shares in the IPO (although the difference is not statistically significant), and have significantly greater IPO proceeds than other firms, on average. Furthermore, SharesPost firms experience positive offer price revision, on average, during the IPO pricing process while all other firms experience negative offer price revision, on average. The difference

Table 1: Variable definitions
This table defines the variables used in our analyses and identifies the source of the data used to calculate the variables.

Variable	Definition	Source
First day return	Logarithm of the percent change from the offer price to the closing price on the first day of trading (i.e., day of offer).	Calculated, CRSP
21 day return	Logarithm of the percent change from the offer price to the closing price on the twenty-first day of trading	Calculated, CRSP
Stock Compensation (%)	(Stock grants + stock options) / (salary + bonus + stock grants + stock options + non-equity incentive compensation + all other compensation). Measured in dollars in the year prior to IPO.	SEC form S-1 registration statement
Non - Stock Compensation (%)	(salary + bonus + non-equity incentive compensation + all other compensation) / (salary + bonus + stock grants + stock options + non-equity incentive compensation + all other compensation). Measured in dollars in the year prior to IPO.	SEC form S-1 registration statement
Shares offered in IPO (%)	Number of shares offered / total shares owned prior to offering	SEC form S-1 registration statement
IPO, # of shares (log)	Logarithm of the number of shares (in millions) offered in the IPO.	Calculated, CRSP
Underwriter rank (average)	Prestige of the underwriter(s) participating in the syndicate, as ranked by Carter and Manaster (1990) and Loughran and Ritter (2004).	Jay Ritter's IPO data[16]
Offer price revision	% change from the Original Middle of Filing Price Range to the eventual Offer Price used in the IPO.	SDC Platinum IPO database
Tech industry	Binary variable equal to one if the IPO firm is in a high tech industry, zero otherwise. High tech is defined as belonging to the biotech, computer equipment, communications, electronics and general technology industries (SIC codes 283, 357, 366, 367, 382, 384, 481, 482, 489, 737, 873).	SDC Platinum IPO database
VC-backed	Binary variable equal to one if the IPO firm received funding from a venture capital firm prior to the IPO, zero otherwise	SDC Platinum IPO database
Exchange	Binary variable equal to one if the IPO is listed on the NASDAQ, and zero if the IPO is listed on the NYSE.	SDC Platinum IPO database
Previous month's IPO return	Average IPO (first day) return in the month prior to the IPO date	Jay Ritter's IPO data[17]
CRSP EW return	Average daily return for the CRSP equal weight index in the month prior to the IPO date	Calculated, CRSP
CRSP EW st. dev.	Standard deviation of average daily returns for the CRSP equal weight index in the month prior to the IPO date	Calculated, CRSP
Firm age as of IPO date (log)	Logarithm of 1 plus the number of years since the firm was founded, measured as of the date of the IPO	Jay Ritter's data on firm founding dates[18]
Number of venture financing rounds	Total number of rounds of capital raised via venture capital firms, prior to IPO	SDC Platinum IPO database
Hot IPO indicator	Binary variable equal to one if the IPO is during a period of very high initial returns in the IPO market, and zero if not.	Lowry, et al. (2010)
Firm sales (log)	Logarithm of firm sales. Measured quarterly.	Calculated, compustat

[16] https://site.warrington.ufl.edu/ritter/ipo-data/
[17] https://site.warrington.ufl.edu/ritter/ipo-data/
[18] http://bear.warrington.ufl.edu/ritter/FoundingDates.htm

Variable	Definition	Source
Firm total assets (log)	Logarithm of total assets. Measured quarterly.	Calculated, compustat
Total liabilities to assets	Total liabilities / total assets. Measured quarterly.	Calculated, compustat
Firm cash flow	Operating income before depreciation / total assets. Measured quarterly.	Calculated, compustat
Firm debt	(Current debt + long term debt) / total assets. Measured quarterly.	Calculated, compustat
Intangible assets	Intangible assets / total assets. Measured quarterly.	Calculated, compustat
Capital expenditures	Capital expenditures / total assets. Measured quarterly.	Calculated, compustat
Advertising expense	Advertising expense / total assets. Measured quarterly.	Calculated, compustat
CEO and chairman	Binary variable equal to one if the CEO is also Chairman of the Board of Directors, and zero if not.	Brick, et al. (2006)
CEO shareholding	CEO ownership of firm stock as a percent of total firm equity.	Brick, et al. (2006)

in mean offer price revisions are significant at the .01% level. The average fees paid by SharesPost firms to underwriters is no different than that of other firms. However, the average prestige rank of the underwriters for SharesPost-listed firms is significantly higher than for other firms. SharesPost firms are also significantly younger and have significantly lower sales, on average, at the time of the IPO. The differences in total assets and cash flow are not statistically significant.

Table 2: Summary statistics of explanatory variables
This table presents summary statistics for the explanatory variables employed in regression analysis of IPO underpricing for the period from 2009 to 2015. Variable definitions are presented in Table 1.

Summary statistics	Mean	Median	Min	Max	Standard deviation	Obs.
SharesPost indicator	0.12	0.00	0.00	1.00	0.33	446
First day return (%)	19.08	11.26	-27.40	148.75	28.37	446
21 day return (%)	21.61	15.72	-44.00	156.48	32.26	446
Underwriter rank (average)	8.17	8.50	0.00	9.00	1.22	446
IPO, # of shares (log)	16.06	15.89	13.59	19.99	0.81	446
Offer price revision	-1.32	0.00	-53.85	45.45	14.87	446
Tech industry indicator	0.49	0.00	0.00	1.00	0.50	446
VC - backed indicator	0.51	1.00	0.00	1.00	0.50	446
Exchange indicator	0.53	1.00	0.00	1.00	0.50	446
Previous month's IPO return (%)	16.23	15.10	-6.00	32.30	8.51	446
CRSP EW return (%)	0.08	0.08	-0.47	1.09	0.16	446
CRSP EW st. dev. (%)	0.80	0.73	0.37	2.79	0.35	446
Total liabilities to assets	0.89	0.78	0.07	10.37	0.79	446
Firm age a/o IPO date (log)	2.67	2.48	0.00	5.15	0.90	446
Firm cash flow (%)	-4.10	2.83	-99.00	67.97	25.83	446
Firm sales (log)	3.61	3.65	2.21	-4.96	10.44	446
Distance	1,433.03	1,637.62	0.38	3,631.80	1,022.68	446

Table 4 reports the standard deviation of initial IPO returns. The standard deviation of first day IPO returns for SharesPost listed firms is about 36% as compared to a standard deviation of about 28% for all other IPO firms. Similarly, the standard deviation of 21 day initial IPO returns is about 39% for SharesPost listed firms, and about 35% for non-SharesPost IPO firms. Given that the SharesPost-listed companies are from industries that typically have greater information asymmetries, these findings are consistent with evidence presented in Lowry, et al. (2010). Lowry, et al. (2010) find that the volatility of

initial IPO returns is higher among firms with higher information asymmetry and, thus, whose value is more difficult for underwriters to estimate.

Table 3: Firm and IPO characteristics of sample firms
This table presents descriptive statistics of firm and IPO characteristics of SharesPost-listed and non-SharesPost-listed IPO firms. The sample period is 2009 to 2015. Explanatory variables are defined in Table 1. The symbols **, and *** denote statistical significance at the 0.05 and 0.01 and levels, respectively.

	SharesPost IPO firms			Non-SharesPost IPO firms			Difference	
	Mean	Median	N	Mean	Median	N	p-value	
First day return (%)	38.20	32.96	55	16.91	8.75	503	<.0001	***
21 day return (%)	32.68	25.03	55	20.20	14.38	503	0.018	**
IPO, shares offered (#, mm)	21.11	8.79	55	13.09	7.05	503	0.108	
IPO proceeds ($, mm)	521.27	150.00	55	243.88	100.00	503	0.001	***
Underwriting fee - gross spread (%)	6.65	7.00	55	6.66	7.00	486	0.170	
Underwriter rank (average)	8.70	8.75	55	7.76	8.40	503	<.0001	***
Total assets ($, mm)	386.00	139.49	55	2,035.47	114.07	503	0.635	
Cash flow (%)	-11.10	-3.40	55	-9.07	1.30	503	0.228	
Firm age a/o IPO	8.58	8.00	55	22.18	11.00	503	0.001	***
Firm sales ($, mm)	85.39	43.20	55	272.43	25.85	469	0.045	**
Offer price revision (%)	11.22	11.11	55	-2.92	0.00	503	<.0001	***

Thus, univariate tests and statistics demonstrate that most of the IPO characteristics of SharesPost-listed firms are greater than those of other IPO firms, while most firm characteristics are not significantly different than that of other firms. Notably, the evidence highlights that SharesPost firms are younger, utilize higher prestige underwriters for the IPO and experience much higher underpricing, on average.

We further examine the influence of a SharesPost listing on IPO returns by running time fixed-effects regression analysis on a SharesPost indicator and control variables for firm and IPO characteristics, tested above, that have been shown in the literature to capture uncertainty about IPO returns. We employ robust standard errors, clustered by time. Table 5 presents the results of these regressions.

Models 1 and 2 report results for 21 day initial IPO returns. Both models report that a SharesPost listing has an insignificant effect on 21 day IPO initial returns. The control variable average underwriter rank has a positive and significant effect on 21 day initial IPO return, consistent with Loughran and Ritter (2004) and Cliff and Denis (2004). The size of the offering (log of shares offered) has a negative and significant effect on 21 day IPO return in Model 2, consistent with the model of Lowry, et al. (2010) in which smaller offerings are harder for underwriters to value (given the relative lack of information about smaller companies), leading to underpricing and high initial IPO returns. Offer price revision has a positive and significant effect on 21 day initial IPO return, a finding consistent with Butler, et al. (2014) who find that offer price revision is a significant predictor of IPO returns. The estimated coefficient for the ratio of total firm liabilities to assets is negative and significant, consistent with Butler, et al. (2014). The estimated coefficient for firm age is positive and significant in Model 2, a finding that is inconsistent with Lowry, et al. (2010). The estimated coefficients for the remaining control variables are either weakly significant or not significant.

Models 3 and 4 run the same specifications, but substitute first day IPO return in place of 21 day IPO return as the dependent variable. The SharesPost indicator variable again has an insignificant effect on first day IPO return. The results are largely similar to those reported in Models 1 and 2; the coefficients of the control variables generally retain the sign reported in Models 1 and 2, but with some differences

Table 4: Standard deviation of initial IPO returns

This table presents the standard deviations of initial IPO returns of SharesPost-listed and non-SharesPost-listed IPO firms. The sample period is 2009 to 2015. First day IPO returns are defined as the percent difference between the close of trading price on the first day of trading and the offer price. 21 day IPO returns are defined as the percent difference between the close of trading price on the 21st day of trading and the offer price.

	SharesPost IPO firms		Non-SharesPost IPO firms	
	Standard Deviation	N	Standard Deviation	N
First day return (%)	36.07	55	28.43	503
21 day return (%)	39.04	55	34.81	503

in significance. The coefficients for underwriter rank and the ratio of total liabilities to assets are either not significant, or weakly significant. The coefficient for the dummy variable VC-backed is positive and significant, consistent with the findings of Lowry, et al. (2010). The coefficient for prior month's CRSP EW return is also positive and significant, an effect opposite of that found in Butler, et al. (2014). Overall, these test results ae inconsistent with the hypothesis that trading in a firm's shares on the SharesPost platform during the pre-IPO period significantly lessens information asymmetry and IPO underpricing.

5.2 Regression analysis that addresses endogeneity of a SharesPost listing

The results in the previous section indicate that listed firms on SharesPost are likely not randomly chosen. Characteristics reported in Table 3 reflect the composition of the IPO firms listed on SharesPost. A review of these firms shows that they are predominately i) located in or around the San Francisco Bay area close to SharesPost's headquarters in San Francisco, ii) young, iii) highly-visible and iv) tech firms. Prominent examples of SharesPost-listed firms include Twitter, Yelp, LinkedIn and Palo Alto Networks.

Because highly-visible firms increase demand and trade volume for the SharesPost platform, these shares tend to be the ones offered for sale on SharesPost. However, these firms also tend to be the ones that attract the most prestigious underwriters, who in turn trade-off higher underpricing for providing all-star analyst coverage, a competitive advantage increasingly sought by issuers (Loughran and Ritter, 2004; Cliff and Denis, 2004). In this way, highly-visible technology firms in the San Francisco Bay area who experience higher levels of underpricing are more likely to be listed on SharesPost. Thus, using a SharesPost dummy variable to explain underpricing presents an endogeneity problem that may bias results in OLS regressions as SharesPost firms are not randomly chosen.

To address the endogeneity problem we also report analysis using two-step instrumental variable (IV) regressions. The first stage estimates SharesPost, an indicator variable that captures a listing on SharesPost, using a probit model that utilizes distance as an instrumental variable. The second stage uses the predicted value from the first stage in our regressions of initial IPO returns. Our asymmetrical information reduction hypothesis predicts that the coefficient of SHP is negative and significantly different from zero.

Distance is measured as the number of miles between an IPO firm's headquarters and the SharesPost headquarters in San Francisco using the latitude and longitude of each firm's postal zip code. Because distance to the SharesPost headquarters is a highly significant determinant of a SharesPost listing (as shown subsequently in Table 6), the instrument used in the first stage regression is strong. Further, as distance is not a significant determinant of initial IPO returns of the population of U.S. IPO firms the instrument satisfies the exclusion restriction. Finally, the model is identified because we have one instrument, distance, that is not included in the second stage regression but is used to predict the endogenous variable SharesPost in the first stage regression.

The results of the first stage of the two-step analysis are reported in Table 6. In the analysis, the dependent variable is a dichotomous variable that takes on a value of one if the IPO firm is listed on SharesPost prior to the IPO and a value of zero if it is not. The results indicate that distance to the

Table 5: Regression of IPO returns on explanatory variables

This table presents the results from OLS regressions of two measures of IPO returns on explanatory variables for the pooled sample of SharesPost-listed and non-SharesPost-listed firms. The sample period is 2009 to 2015. 21 day IPO returns are defined as the percent difference between the close of trading price on the 21st day of trading and the offer price. First day IPO returns are defined as the percent difference between the close of trading price on the first day of trading and the offer price. Explanatory variables are defined in Table 1. T-stats, adjusted for clustering at the time level, are reported in parentheses. The symbols*, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

Dependent variable	(1)		(2)		(3)		(4)	
Explanatory variables	*21 day return*		*21 day return*		*First day return*		*First day return*	
SharesPost indicator	-0.05		-0.01		0.06		0.06	
	(0.82)		(0.19)		(1.18)		(1.03)	
Underwriter rank (average)	0.03	***	0.03	***	0.01		0.01	
	(2.36)		(2.65)		(1.45)		(0.95)	
IPO, # of shares (log)	-0.02		-0.04	**	-0.03	**	-0.05	***
	(0.99)		(1.99)		(2.14)		(3.04)	
Offer price revision	0.01	***	0.01	***	0.01	***	0.01	***
	(9.05)		(9.36)		(11.08)		(10.53)	
Tech industry indicator	0.01		0.01		-0.03		-0.03	
	(0.27)		(0.29)		(1.30)		(1.22)	
VC - backed indicator	0.07	*	0.06		0.07	**	0.08	***
	(2.08)		(1.51)		(2.32)		(2.73)	
Exchange indicator	0.05		0.03		0.03		0.03	
	(1.57)		(0.84)		(1.38)		(0.99)	
Previous month's IPO return	0.03		-0.23		-0.08		-0.17	
	(0.19)		(1.23)		(0.51)		(1.03)	
CRSP EW return	4.02		10.35		22.25	***	20.65	***
	(0.46)		(1.20)		(3.45)		(3.06)	
CRSP EW st. dev.	2.98		1.41		0.38		3.60	
	(0.64)		(0.34)		(0.12)		(1.04)	
Total liabilities to assets	-0.04	***	-0.06	***	-0.03	**	-0.02	
	(3.03)		(3.93)		(2.19)		(1.46)	
Firm age a/o IPO date (log)	0.00		0.03	**	0.01		0.01	
	(0.12)		(2.03)		(0.57)		(0.85)	
Firm cash flow	0.02		0.11		0.03		0.02	
	(0.24)		(1.29)		(0.63)		(0.33)	
Firm sales (log)			-0.01				0.01	
			(1.00)				(1.30)	
Constant	0.11		0.50		0.43	**	0.76	***
	(0.34)		(1.60)		(2.01)		(2.83)	
Time fixed effects	Yes		Yes		Yes		Yes	
R-squared	0.23		0.26		0.30		0.33	
Observations	558		453		558		453	

SharesPost headquarters is a highly significant predictor of a SharesPost listing, with the likelihood of a listing decreasing the further away the firm is located. The results also indicate that being a technology firm is a significant predictor of a SharesPost listing, as is the size of the firm. Thus, San Francisco Bay area technology firms with high revenue are most likely to list on the exchange.

The results of the second stage regression of the two-step analysis are reported in Table 7. We again employ robust standard errors, clustered by time. Models 1 and 2 report results for the 21 day initial IPO return, Models 3 and 4 for the first day IPO return. For the 21 day return in the first two columns, the estimated coefficient for SharesPost, the predicted value of a SharesPost listing from the

model reported in Table 6, is negative but not statistically significant. The estimated coefficient for the predicted SharesPost variable is positive but, again, is not statistically significant in the regressions for first day return in Models 3 and 4. These results are similar to the results from OLS regressions reported in Table 5. Generally consistent with the results from the OLS regressions - underwriter rank, offer price revision, CRSP EW return and the dummy variable VC-backed remain significant drivers of IPO returns. Thus, the results for the SharesPost variable do not support our asymmetrical information reduction hypothesis.

Table 6: First stage probit regression analysis of a SharesPost listing
This table presents the results from a probit regression analysis of a SharesPost listing. The sample period is 2009 to 2015. The dependent variable is an indicator that equals one if the IPO firm is listed on the SharesPost platform during the pre-IPO period and equals zero if the IPO firm is not listed on the SharesPost platform. Explanatory variables are defined in Table 1. The Wald chi-square statistics of the regression coefficients are reported in parentheses. The symbol *** denotes statistical significance at the 0.01 level.

Dependent variable	*SharesPost*	
Explanatory variables	*indicator*	
Distance	-0.0004	***
	(23.67)	
Tech industry indicator	0.59	***
	(10.06)	
Firm sales (log)	0.13	***
	(7.55)	
Constant	-1.49	***
	(31.62)	
Log likelihood	-142.23	
χ^2	37.03	
Observations	446	

5.3 Two-stage IV regression analysis of matched sample of technology firms

Although the set of control variables utilized in the preceding regressions are robust, it may be that they do not adequately control for the firm characteristics of SharesPost-listed firms. To examine the sensitivity of our findings to this possibility, we form a control group of like firms that have not listed on SharesPost by matching on industry, as measured by firm's three-digit SIC code. We restrict the non-SharesPost control firms in the subsequent regressions to be only high-tech as defined as belonging to the biotech, computer equipment, communications, electronics and general technology industries (SIC codes 283, 357, 366, 367, 382, 384, 481, 482, 489, 737, 873). We utilize the same two-step approach and specification as used in Section 5.2.

The results of the first stage of the two-step analysis are reported in Table 8. For purposes of this regression, we substitute an exchange indicator variable in place of the technology indicator used in the previous regressions. Reported results indicate that the first stage remains strong. The results of the second stage of the two-step analysis are reported in Table 9. In all four models, the predicted value of the SharesPost variable is insignificant. These results, overall, are similar to the results from the OLS and two-step regressions reported in Sections 5.1 and 5.2, however the magnitudes of the control variables are generally smaller, reflecting the reduced sample size. Offer price revision, CRSP EW return and firm age are significant drivers of first day IPO returns for the technology firms tested, while offer price revision is a significant driver of 21 day initial IPO returns. These results do not support the hypothesis that a SharesPost listing significantly lessens information asymmetry and IPO underpricing.

Table 7: Second stage treatment regression of IPO returns

This table presents the results from two-step treatment regressions using an instrumental variable approach to control for endogeneity. The sample period is 2009 to 2015. 21 day IPO returns are defined as the percent difference between the close of trading price on the 21st day of trading and the offer price. First day IPO returns are defined as the percent difference between the close of trading price on the first day of trading and the offer price. Predicted SharesPost indicator is the predicted value from the first stage of the probability of a pre-IPO listing on SharesPost. Remaining explanatory variables are defined in Table 1. T-stats, adjusted for clustering at the time level, are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

Dependent variable	(1)		(2)		(3)		(4)	
Explanatory variables	*21 day return*		*21 day return*		*First day return*		*First day return*	
Predicted SharesPost indicator	-0.06		-0.001		0.10		0.04	
	(0.30)		(0.00)		(0.62)		(0.26)	
Underwriter rank (average)	0.02	**	0.03	**	0.01		0.01	
	(2.32)		(2.45)		(1.26)		(1.00)	
IPO, # of shares (log)	-0.05	***	-0.04	*	-0.04	***	-0.05	***
	(2.62)		(1.92)		(2.80)		(3.08)	
Offer price revision	0.01	***	0.01	***	0.01	***	0.01	***
	(9.69)		(9.63)		(11.01)		(11.03)	
Tech industry indicator	0.02		0.01		-0.05		-0.04	
	(0.49)		(0.20)		(1.59)		(1.22)	
VC - backed indicator	0.06		0.05		0.07	**	0.08	**
	(1.58)		(1.34)		(2.33)		(2.52)	
Exchange indicator	0.03		0.03		0.03		0.03	
	(0.96)		(0.79)		(0.99)		(1.12)	
Previous month's IPO return	-0.22		-0.23		-0.22		-0.21	
	(1.16)		(1.21)		(1.32)		(1.28)	
CRSP EW return	9.53		10.10		20.97	***	20.46	***
	(1.12)		(1.16)		(3.09)		(3.03)	
CRSP EW st. dev.	1.41		1.37		4.36		4.40	
	(0.35)		(0.34)		(1.32)		(1.33)	
Total liabilities to assets	-0.05	***	-0.06	***	-0.02		-0.02	
	(3.75)		(3.85)		(1.33)		(1.25)	
Firm age a/o IPO date (log)	0.03	**	0.03	*	0.01		0.01	
	(1.81)		(1.90)		(1.21)		(0.70)	
Firm cash flow	0.08		0.11		0.04		0.01	
	(0.94)		(1.27)		(0.64)		(0.15)	
Firm sales (log)			-0.01				0.01	
			(0.96)				(1.35)	
Constant	0.66	**	0.51		0.56	**	0.70	***
	(2.27)		(1.56)		(2.38)		(2.66)	
Time fixed effects	Yes		Yes		Yes		Yes	
R-squared	0.26		0.26		0.34		0.34	
Observations	446		446		446		446	

5.4 Matched sample analysis of IPO returns

As a robustness test, we next examine the influence of a SharesPost listing on IPO returns by performing a more rigorous matched sample analysis. It may be that controlling only for industry risk, as we do in the previous section, does not adequately mitigate heterogeneity in firm and industry characteristics. To do so, we form the control group by selecting from the population of non-SharesPost IPO firms those

firms that match the treatment group (SharesPost firms) along five dimensions: IPO date, venture capital funding, industry, total assets and firm age. We match firms, without replacement, using the following five criteria: the control firm 1) has at least one round of venture capital funding, 2) went public during the sample period 2000 to 2015, 3) competes in the same industry as the matched SharesPost firm, as measured by firm's three-digit SIC code, 4) has total assets greater than 75%, but less than 125%, of the matched SharesPost firm, and 5) is older than 75%, but younger than 125%, of the age of the matched SharesPost firm, as of date of the IPO. By matching along these dimensions we are able to effectively control for risk along lines of business, regimes of hot/cold IPO markets, and idiosyncratic risk. Applying these data restrictions reduces the initial sample of SharesPost firms from 62 to 34 firms, which are matched to 34 control firms[19]; hence, the total sample size used for the analysis that follows is 68 firms.

Table 8: First stage probit regression analysis of a SharesPost listing for matched sample
This table presents the results from a probit regression analysis of a SharesPost listing for technology firms. The sample period is 2009 to 2015. The dependent variable is an indicator that equals one if the IPO firm is listed on the SharesPost platform during the pre-IPO period and equals zero if the IPO firm is not listed on the SharesPost platform. Explanatory variables are defined in Table 1. The Wald chi-square statistics of the regression coefficients are reported in parentheses. The symbols **, and *** denote statistical significance at the 0.05 and 0.01 and levels, respectively.

Dependent variable	*SharesPost*	
Explanatory variables	*indicator*	
Distance	-0.0004	***
	(16.82)	
Exchange indicator	0.31	
	(2.01)	
Firm sales (log)	0.17	**
	(5.07)	
Constant	-0.82	**
	(5.75)	
Log likelihood	-95.82	
χ^2	19.74	
Observations	172	

Table 10 reports the results of univariate tests of IPO returns and the variables used to explain IPO returns. IPO returns for SharesPost firms are statistically indistinguishable from that of control firms, on average, for both first day and 21 day IPO returns. Fees paid by SharesPost firms to underwriters, as well as the average prestige rank of the underwriters, are also virtually identical to that of control firms. However, SharesPost firms have significantly larger IPO offerings, as measured by the number of shares offered in the IPO and IPO proceeds. Most measures of firm size - total assets, firm sales and firm age - are statistically indistinguishable, however, SharesPost firms have significantly lower cash flow than control firms. Overall, the firm and IPO characteristics of the SharesPost and control groups are statistically similar, with the exception of the level of cash flow and size of the IPO offerings.

Table 11 presents the results of OLS regression analysis. We again examine the influence of a SharesPost listing on IPO returns by regressing IPO returns on a SharesPost indicator and the same set of control variables for firm and IPO characteristics utilized in tests in the previous sections. We again employ clustered robust standard errors, clustered by time.

[19] The distribution of IPO dates for the sample of control firms is [year (firms)]: 2015-2009 (22), 2008 (1), 2007 (7), 2005 (1), 2004 (1), 2000 (2).

Table 9: Second stage treatment regression of IPO returns for technology firms

This table presents the results from two-step treatment regressions using an instrumental variable approach to control for endogeneity. The sample period is 2009 to 2015. 21 day IPO returns are defined as the percent difference between the close of trading price on the 21st day of trading and the offer price. First day IPO returns are defined as the percent difference between the close of trading price on the first day of trading and the offer price. Predicted SharesPost indicator is the predicted value from the first stage in Table 8 of the probability of a pre-IPO listing on SharesPost for technology firms. Remaining explanatory variables are defined in Table 1. T-stats, adjusted for clustering at the time level, are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable	*21 day return*	*21 day return*	*First day return*	*First day return*
Explanatory variables	Second Stage	Second Stage	Second Stage	Second Stage
SharesPost indicator	-0.03	0.07	-0.04	-0.02
	(0.13)	(0.33)	(0.28)	(0.15)
Underwriter rank (average)	0.06	0.08 *	0.05	0.05
	(1.48)	(1.77)	(1.48)	(1.49)
IPO, # of shares (log)	-0.02	0.01	-0.01	0.00
	(0.62)	(0.25)	(0.40)	(0.08)
Offer price revision	0.01 ***	0.01 ***	0.01 ***	0.01 ***
	(3.98)	(3.90)	(5.72)	(5.67)
Tech industry indicator	0.03	0.01	-0.06	-0.07
	(0.53)	(0.15)	(1.30)	(1.35)
VC - backed indicator	0.00	-0.02	0.04	0.03
	(0.00)	(0.33)	(0.61)	(0.51)
Exchange indicator	-0.01	-0.03	0.00	0.00
	(0.24)	(0.58)	(0.07)	(0.02)
Previous month's IPO return	0.21	0.19	0.33	0.33
	(0.51)	(0.50)	(1.25)	(1.23)
CRSP EW return	12.15	14.18	21.99 **	22.46 **
	(0.86)	(1.00)	(2.02)	(2.03)
CRSP EW st. dev.	-7.61	1.00	-2.21	-2.15
	(1.13)	(1.11)	(0.39)	(0.38)
Total liabilities to assets	-0.03	-0.03	-0.02	-0.02
	(0.64)	(0.51)	(0.38)	(0.35)
Firm age a/o IPO date (log)	-0.08	-0.07	-0.09 **	-0.09 **
	(1.56)	(1.40)	(2.31)	(2.25)
Firm cash flow	0.03	0.12	-0.02	0.01
	(0.21)	(0.87)	(0.10)	(0.04)
Firm sales (log)		-0.04		-0.01
		(1.23)		(0.39)
Constant	0.25	-0.40	0.08	-0.07
	(0.41)	(0.48)	(0.16)	(0.10)
Time fixed effects	Yes	Yes	Yes	Yes
R-squared	0.20	0.21	0.31	0.31
Observations	172	172	172	172

Model 1 reports that a SharesPost listing has an insignificant effect on 21 day IPO return. Average rank of the underwriters in the syndicate has a positive and significant effect, while previous month's IPO return has a negative and significant effect. The remaining control variables have an insignificant effect on 21 day IPO return. Models 2 and 3 use the specifications from previous tests; again the

SharesPost dummy has an insignificant effect on 21 day IPO return.[20] The lack of statistically significant results for the controls is likely due to the lack of variability within each variable (as reported in Table 10) produced by matching the treatment and control firms on 5 dimensions.

Table 10: Firm and IPO characteristics of matched sample firms
This table presents descriptive statistics of firm and IPO characteristics of a matched sample of SharesPost-listed and non-SharesPost-listed firms. The sample period is 2000 to 2015. Explanatory variables are defined in Table 1. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

	SharesPost IPO firms			Control IPO firms			Difference	
	Mean	Median	N	Mean	Median	N	p-value	
First day return (%)	33.69	29.95	34	39.35	31.86	34	0.917	
21 day return (%)	32.76	31.51	34	44.86	31.16	34	0.883	
IPO, shares offered (#, mm)	12.86	7.54	34	5.16	5.88	34	0.010	***
IPO proceeds ($, mm)	212.28	121.30	34	97.14	100.40	34	0.017	**
Underwriting fee - gross spread (%)	6.78	7.00	34	6.77	7.00	34	0.273	
Underwriter rank (average)	8.67	8.75	34	8.63	8.79	34	0.390	
Total assets ($, mm)	212.68	120.15	34	295.47	105.55	34	0.783	
Cash flow (%)	-10.21	-2.95	34	-0.28	1.71	34	0.094	*
Firm age a/o IPO	9.32	8.00	34	9.46	9.00	34	0.844	
Firm sales ($, mm)	55.21	30.37	34	62.32	42.29	34	0.908	

Models 4, 5 and 6 use similar specifications but substitute first day IPO return in place of 21 day IPO return as the dependent variable. Results are largely similar. The SharesPost indicator variable again has an insignificant effect on first day IPO return while offer price revision has a positive and significant effect and the tech industry dummy has a negative and significant effect. Overall, these test results are again inconsistent with the hypothesis that trading in a firm's shares on the SharesPost platform during the pre-IPO period significantly lessens information asymmetry and IPO underpricing.

In summary, the results of analyses presented in Section 5 indicate that pre-IPO trading in a firm's shares on the SharesPost platform does not significantly lessen information asymmetry, nor IPO underpricing. SharesPost-listed IPO firms tend to be highly-visible technology firms who receive much press and investor attention and publicity. Because SharesPost does not publicly release trading data, nor require the release of firm financial data, and many listing firms are reluctant to release additional private information to new owners, potential reductions in existing information asymmetries appear to be limited to market data privately available to participants. Analysis in this paper shows that the additional information provided by private trading in the shares on SharesPost provides little additional information to significantly attenuate uncertainty during the IPO process.

6. The benefits of a SharesPost listing

6.1 Executive compensation

The sample we have compiled for this study also provides an excellent opportunity to examine a purported benefit of the private secondary market: liquidity provision to firm employees. If the

20 The matched sample used for the regressions in Table 10 creates a high degree of collinearity in the variable IPO, # of shares (log) – a VIF test in SAS produces a VIF coefficient of around 10. We exclude the coefficient for this reason in Models 2 and 5, but include it in the full specifications in Models 3 and 6 in the interest of full disclosure to test the previous specifications.

Table 11: Regression of IPO returns on explanatory variables

This table presents the results from OLS regressions of two measures of IPO returns on explanatory variables for the pooled sample of SharesPost-listed and non-SharesPost-listed control firms. The sample period is 2000 to 2015. Explanatory variables are defined in Table 1. T-stats, adjusted for clustering at the time level, are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variables	*21 day return*	*21 day return*	*21 day return*	*First day return*	*First day return*	*First day return*
SharesPost indicator	-0.07	-0.04	-0.06	0.02	0.03	0.05
	(0.66)	(0.33)	(0.52)	(0.29)	(0.35)	(0.52)
Underwriter rank (average)	0.55 **	0.56 **	0.57 **	-0.03	0.04	0.03
	(2.14)	(2.43)	(2.41)	(0.32)	(0.38)	(0.28)
IPO, # of shares (log)			0.02			0.00
			(0.89)			(0.01)
Offer price revision	0.00	0.00	0.00	0.01 ***	0.01 **	0.01 **
	(0.70)	(0.95)	(0.78)	(2.90)	(2.62)	(2.49)
Tech industry indicator		-0.26	-0.25		-0.31 **	-0.31 **
		(1.46)	(1.29)		(2.39)	(2.29)
VC - backed indicator	-0.01	-0.04	-0.02	-0.07	-0.04	-0.05
	(0.10)	(0.32)	(0.11)	(0.51)	(0.26)	(0.31)
Exchange indicator		0.07	0.08		0.03	0.00
		(0.65)	(0.68)		(0.28)	(0.00)
Previous month's IPO return	-1.23 *	-1.05	-0.94	-0.21	0.15	0.29
	(1.75)	(1.35)	(1.12)	(0.33)	(0.21)	(0.39)
CRSP EW return		11.72	20.00		60.59	66.11
		(0.22)	(0.35)		(1.34)	(1.35)
CRSP EW st. dev.		28.46	29.98		7.89	9.53
		(1.27)	(1.29)		(0.39)	(0.46)
Total liabilities to assets	-0.12	-0.11	-0.12	0.22	0.26	0.29
	(0.55)	(0.51)	(0.53)	(1.08)	(1.35)	(1.43)
Firm age a/o IPO date (log)	-0.23	-0.23	-0.22	-0.21	-0.28 *	-0.27 *
	(1.11)	(1.00)	(0.93)	(1.37)	(1.85)	(1.96)
Firm cash flow	-0.63	-0.49	-0.42	0.41	0.51	0.63
	(1.21)	(0.93)	(0.76)	(1.02)	(1.10)	(1.29)
Firm sales (log)			-0.02			0.05
			(0.29)			(1.34)
Constant	-0.41	-0.65	-0.83	1.84 **	1.61 *	1.76 **
	(0.20)	(0.31)	(0.38)	(2.27)	(1.88)	(2.05)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.70	0.72	0.72	0.38	0.44	0.45
Observations	68	68	68	68	68	68

lengthening of the start-up cycle increases liquidity risk then private secondary marketplaces like SharesPost that provide liquidity in the pre-IPO market should decrease liquidity risk. We hypothesize that companies that list on SharesPost will be able to offer their executives more stock-based compensation and that employees will sell less shares during the IPO, due to the pre-IPO liquidity provided by SharesPost.

In this section we examine the effect of a SharesPost listing on liquidity provision to firm executives and founders. Because compensation varies considerably by industry and firm risk levels, we utilize matched sample analysis to ensure the sample is comprised of like firms. We again examine the matched sample used in the foregoing analysis presented in section 5.4. To normalize variables, all variables are winsorized at the 10% and 90% level.

To test the impact of a SharesPost listing on firm compensation, we hand collect data on the annual compensation of "named executive officers" provided in the Executive Compensation section of firm S-1 registration statements. The data outlines the total compensation owed to the named executive officers in the years preceding IPO. For purposes of this analysis, we utilize compensation data for the year preceding IPO, as data for the two years preceding IPO is available in only about half of our sample firms. The data also outlines the form and timing of the compensation. We rely on the estimate of U.S. dollar value provided by the firms in the S-1 statements for stock grants and stock options.[21]

There are an average of 5 named executives listed in the S-1 statements of the firms that make up our sample. Compensation amounts vary considerably: the mean (median) annual compensation for an executive is $1.2 ($0.7) million, with a high of $3.3 million and a low of $1.3 million. Table 12 reports descriptive statistics about the proportion of annual employee compensation paid in stock vs. non-stock, as well as tests of differences. Firms that list on the SharesPost platform pay 54% of total employee compensation in stock and stock option in the year before IPO, on average, as measured by the variable % Stock compensation. This percentage is significantly higher than the 35% average for firms that do not list on SharesPost. As expected, the complementary measure, % Non-stock compensation, has the opposite result; firms that do not list on SharesPost pay 65% of total employee compensation in non-stock, a significantly larger percentage than the 46% paid by SharesPost firms. This finding supports the hypothesis that firms listed on SharesPost are able to pay their employees in stock and stock options, in the year before going public, to a greater extent than non-SharesPost companies, given the liquidity that the SharesPost platform provides.

We next use regression analysis to further examine the influence of a SharesPost listing on the percentage of employee annual compensation paid in stock prior to the IPO. Because the possible values of the dependent variable (percentage of employee annual compensation paid in stock) are bounded by zero and one, we treat the variable as a censored continuous variable. As such, we employ a two-limit Tobit model with a lower bound of zero and upper bound of one.[22] We again include variables to control for firm, industry and financing characteristics; for this analysis we also add control variables shown to determine the level and structure of executive compensation. Because the literature on compensation finds a positive relationship between firm complexity and compensation (e.g., Core et al., 1999; Murphy, 1999 and Brick et al., 2006), we include control variables, such as size, leverage, cash flow and intangible assets, that proxy for firm complexity and risk. Executive compensation may also be related to the governance structure of the firm, hence, we include control variables used in the literature to proxy for firm governance. We again use an indicator variable to capture a SharesPost listing.

21 All firms in the sample valued stock grants and stock options awarded to executive officers as the fair value as of grant date, valued using either a Black Scholes or Binomial framework.

22 We thank an anonymous referee for this suggestion.

Table 12: Executive and director compensation and shareholdings

This table presents descriptive statistics for forms of executive compensation and shareholdings offered in IPOs for SharesPost-listed and non-SharesPost-listed control firms. The sample period is 2000 to 2015. Percent stock compensation is the percentage of executive employee annual compensation paid in stock and stock options in the year before IPO. Percent non-stock compensation is the percentage of executive employee annual compensation paid in non-stock and non-stock options in the year before IPO. Percent shares offered in the IPO is the percentage of total shares owned by executives and directors (prior to offering) sold in the IPO. The symbol *** indicates significance at the .01 level.

	N	Mean	Median	Std. Dev.	Min.	Max.
Panel A: SharesPost IPO firms						
Stock Compensation (%)	34	53.90	56.60	28.38	0.00	87.54
Non - Stock Compensation (%)	34	46.10	43.40	28.38	12.46	100.00
Shares offered in IPO (%)	34	0.75	0.00	1.37	0.00	4.47
Panel B: Control IPO firms						
Stock Compensation (%)	34	34.72	26.95	31.88	0.00	87.54
Non - Stock Compensation (%)	34	65.28	73.05	31.88	12.46	100.00
Shares offered in IPO (%)	34	1.13	0.08	1.67	0.00	4.47
Panel C: Differences						
Stock Compensation (%)		0.009 ***	0.002 ***			
Non - Stock Compensation (%)		0.009 ***	0.002 ***			
Shares offered in IPO (%)		0.195	0.468			

Model 1 of Table 13 reports that the estimated coefficient for the variable of interest, the SharesPost indicator, is positive and significant. The technology industry indicator variable and size variable, total assets, are also positive and significant. Models 2 and 3 add control variables for compensation, firm, industry and financing characteristics; in both models the SharesPost and technology industry indicator variables again have a positive and significant effect on % Stock compensation. Model 4 adds the governance control variables, CEO & Chairman and CEO shareholding; results are qualitatively unchanged. In these models, the total assets variable again has a positive and significant effect on % Stock compensation, while the firm sales variable has a negative and significant effect. The results for the technology industry variable are consistent with existing evidence that technology firms pay more in stock than cash; the result for the sales variable is consistent with existing evidence that firms with greater cash flow pay more in cash compensation. Thus, test results reported in Table 13 provide additional support for the hypothesis that a SharesPost listing significantly influences the form of compensation paid to employees before IPO.

6.2 Stakeholder participation in IPO

As a second test of the hypothesis that listing on SharesPost allows firms to reward employees more with stock and stock options than comparable non-SharesPost firms, we examine the level of stockholdings offered by firm officers and directors during the IPO. The IPO process is often regarded as a means for firm founders, officers and other stakeholders to "cash out" of their holdings of firm stock. If SharesPost provides liquidity pre-IPO, then those stakeholders should offer a smaller percentage of their holdings of firm stock in the IPO than officers in non-SharesPost firms, all else equal.

To test the impact of a SharesPost listing on compensation liquidity, we hand collect data on stakeholder stock ownership from the Principal and Selling Stockholder section of firm S-1 registration statements. The section provides data on the number of shares owned prior to the IPO, and subsequently offered in the IPO, by named officers, directors and stockholders. For purposes of this analysis, we utilize data on the stock ownership of named officers and directors.

Table 13: Regression of stock compensation on explanatory variables

This table presents the results from Tobit regressions of the percent of firm officer's compensation paid in stock and stock options on explanatory variables for the pooled sample of SharesPost-listed and non-SharesPost-listed control firms. Regressions utilize a two-limit Tobit model with a lower bound of zero and upper bound of one. The sample period is 2000 to 2015. Explanatory variables are defined in Table 1. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

Stock Compensation (%)				
Explanatory Variables	(1)	(2)	(3)	(4)
SharesPost indicator	0.14 *	0.15 *	0.14 *	0.14 *
	(1.68)	(1.80)	(1.70)	(1.68)
Tech industry indicator	0.33 **	0.38 ***	0.38 ***	0.38 ***
	(2.49)	(2.93)	(2.92)	(2.89)
Firm cash flow		0.01	0.03	0.02
		(0.06)	(0.12)	(0.11)
Firm total assets (log)	0.13 **	0.24 **	0.25 ***	0.25 ***
	(2.47)	(2.52)	(2.63)	(2.63)
Firm sales (log)		-0.16 *	-0.18 *	-0.18 *
		(1.75)	(1.88)	(1.81)
Firm age a/o IPO date		0.00	0.00	0.00
		(0.11)	(0.05)	(0.05)
Number of venture financing rounds		0.01	0.00	0.00
		(0.34)	(0.25)	(0.25)
Advertising expense			0.80	0.79
			(0.74)	(0.73)
Firm debt		0.47	0.44	0.44
		(1.51)	(1.38)	(1.32)
Capital expenditures		-0.65	-0.61	-0.62
		(0.86)	(0.80)	(0.78)
Intangible assets		-0.07	-0.09	-0.10
		(0.29)	(0.38)	(0.38)
CEO and chairman				0.00
				(0.06)
CEO shareholding				0.04
				(0.06)
Constant	-0.72 **	-0.42	-0.44	-0.45
	(2.23)	(0.95)	(0.99)	(0.99)
Time fixed effects	Yes	Yes	Yes	Yes
Log likelihood	-20.60	-16.95	-16.68	-16.67
Observations	68	68	68	68

The median market value of IPOs in our sample is $105 million, comparable to the median value of U.S. IPOs over the same period, $108 million.[23] There are an average of 12 named executives and directors who own stock in their firms prior to the IPO; they sell shares in 32 of the 68 IPOs tested in this section. Table 12 reports descriptive statistics about the proportion of officer and director stock offered for sale in the IPO. Officers and directors in SharesPost-listed firms offer a smaller percentage of their stock holdings in the IPO (mean of 0.75% and median of 0.00%) as compared to control firms (mean of 1.13% and median of 0.08%), although the difference is not statistically significant.

Table 14 reports the test results of the effect of a SharesPost listing on the percent of officers' and directors' stock holding offered as part of the firm IPO. We include in the regressions the same

[23] 2017 IPO Report, Harvard Law School Forum on Corporate Governance and Financial Regulation, May 25, 2017.

firm, industry, financing and compensation control variables from the previous tests; we again utilize a Tobit model with a lower bound of zero and upper bound of one. Because the literature documents periods of very high initial returns in the IPO market (see, e.g., Ibbotson, et al., 1988 and 1994; Lowry, et al., 2010) we also include an indicator variable to control for these "hot" IPO markets. Hot IPO markets may induce executive officers to forego liquidating a portion of their equity holdings via SharesPost to capture the excess returns available in the IPO market during these times. The variable hot IPO takes on a value of 1 if the IPO is during the years 2004 to 2007, 0 otherwise.

Table 14: Regression of executive officer's shares offered in IPO on explanatory variables
This table presents the results from Tobit regressions of the percent of firm officer's shares offered in the IPO on explanatory variables for the pooled sample of SharesPost-listed and non-SharesPost-listed control firms. Regressions utilize a two-limit Tobit model with a lower bound of zero and upper bound of one. The sample period is 2000 to 2015. Explanatory variables are defined in Table 1. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 and levels, respectively.

Shares offered in IPO (%)				
Explanatory Variables	(1)	(2)	(3)	(4)
SharesPost indicator	-0.01 **	-0.01 *	-0.01 *	-0.01 *
	(1.97)	(1.73)	(1.67)	(1.66)
Tech industry indicator	0.01	0.01	0.01	0.01
	(0.80)	(1.01)	(1.05)	(1.02)
Hot IPO indicator		-0.03	-0.03	-0.03
		(1.57)	(1.42)	(1.39)
Firm cash flow		0.02	0.03	0.02
		(1.09)	(1.58)	(1.28)
Firm total assets (log)		0.00	0.00	0.00
		(0.23)	(0.56)	(0.15)
Firm sales (log)		0.00	-0.01	0.00
		(0.47)	(0.92)	(0.69)
Firm age a/o IPO date		0.00	0.00	0.00
		(0.66)	(1.35)	(1.12)
Number of venture financing rounds		-0.002	-0.002	-0.002 *
		(1.48)	(1.62)	(1.72)
Firm debt			0.06 ***	0.06 **
			(2.92)	(2.43)
Intangible assets				0.013
				(0.68)
Constant	0.02	0.06 *	0.05	0.05 *
	(1.39)	(1.73)	(1.63)	(1.70)
Time fixed effects	Yes	Yes	Yes	Yes
Log likelihood	57.65	61.65	65.76	65.99
Observations	68	68	68	68

Model 1 reports that the estimated coefficient for the SharesPost indicator variable is negative and significant; the estimated coefficient for the Technology industry dummy is not significant. Models 2, 3 and 4 add firm, industry financing and compensation control variables. In each model the SharesPost indicator has a negative and significant effect on the Percent of officer shares offered in the IPO. Firm debt has a positive and significant estimated coefficient while the variable Number of venture financing rounds has a negative and significant estimated coefficient. Thus, test results reported in Table 14 provide support for the hypothesis that a SharesPost listing provides significant liquidity to employees before an IPO; firm officers and directors are not as reliant on an IPO for liquidity as officers and directors in firms who do not have access to SharesPost.

The analyses presented in this section indicates that the SharesPost platform provides some level of liquidity to the stakeholders of SharesPost-listed private firms during the pre-IPO period. Test results show that SharesPost-listed private firms are able to pay their employees less in cash and more in stock and stock options than non-SharesPost companies. Test results also show that founders, officers and directors in SharesPost-listed private firms sell less shares during the IPO, suggesting that liquidity provision via the SharesPost platform reduces the amount of capital raised in a funding event that must be allocated to meet employee needs.

7. Summary and conclusion

The U.S. private securities secondary market is growing in both size and importance. The market has evolved over the past thirty years to become a viable source of liquidity for private equity investors, accredited individual investors, private firm employees and others interested in investing in, or exiting, private firm investments. The SharesPost private securities exchange platform is a prominent intermediary in the private secondary market that may potentially benefit private firms and their employees by providing increased liquidity and price formation during the pre-IPO stage of company growth. Yet, relatively little academic research focuses on the effects of trading in the U.S. private securities markets.

In this study, we test several hypotheses about private companies that list on the SharesPost exchange. First, we test whether pre-IPO trading in an IPO firm's shares on the SharesPost platform lessens information asymmetry and subsequent IPO underpricing. While we find evidence to indicate that firm characteristics of the average IPO firm listed on SharesPost are significantly different than those of the average IPO firm, when we control for these factors in subsequent tests we find no evidence that a pre-IPO listing on SharesPost lessens IPO underpricing. We highlight this as fruitful area for future research as the growth of the secondary market provides more data for empirical testing.

We also find that SharesPost-listed private firms are able to pay their employees less in cash and more in stock and stock options than non-SharesPost companies. Further, we find that founders and executives in SharesPost-listed private firms sell less shares during the IPO. These results are robust to industry, firm, compensation and financing characteristics. These findings suggest that liquidity provision via the SharesPost platform significantly influences the form of compensation paid to employees before IPO and reduces the amount of capital raised in a funding event such as a public offering that must be allocated to meet employee needs rather than fund company growth.

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